СТОМАТОЛОГІЯ

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Integrated Approach to the Diagnosis and Treatment of Endo-Periodontal Lesions

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The purpose of the study was to increase the effectiveness of diagnosis and treatment of patients with endo-periodontal lesions.

Materials and methods. The study was conducted from 2019 to 2022 on the basis of the Department of Therapeutic Dentistry of the Azerbaijan Medical University. 41 patients with endo-periodontal lesions who were not burdened with somatic pathology with combined endodontic and periodontal lesions were examined. Radiation diagnostic methods, in particular orthopantomography and intraoral targeted radiographs, were carried out in both groups and in all patients in these groups before the start of therapeutic measures and 6 and 12 months after their completion. The selected groups of patients were practically comparable in gender and age composition (p>0.05).

All persons with the same diagnosis, depending on the therapeutic method or treatment algorithm, were divided into two groups: I – with the diagnosis of endo-periodontal lesions – 20 patients of the main group, who, along with standard treatment, were additionally treated with decontamination of root canal and laser curettage with a dental diode laser (Picasso Life); II – with a diagnosis of endo-periodontal lesions – 21 patients of the control group.

Root canal treatment: mechanical expansion with endodontic instruments, antiseptic treatment with 3% sodium hypochlorite solution, 17% EDTA solution. To remove dental deposits in the control group, scaling, curettage with Gracie curettes were performed, and an ultrasound device "Piezon Master 600" ™ EMS was used. Cleaning and polishing of the teeth surface was carried out with an abrasive paste. Patients of the main group were additionally treated with a diode laser. Patients of the control group did not undergo such a procedure.

Results and discussion. According to the results of the behavioral study, the values of the hygienic index, the gingivitis index and the periapical index before the start of the course of basic therapy for endo-periodontal complications were comparable in both study groups. In terms of follow-up, statistically significant differences were clearly expressed 12 months after treatment.

The high frequency of occurrence of combined periodontal and endodontic tissue diseases in male and female individuals, as well as the increase in their prevalence with age, certain difficulties in the diagnosis and treatment of endo-periodontal lesions, causes constant and increased interest in this problem. The results of the index evaluation showed pronounced anti-inflammatory and stimulating bone tissue repair properties of laser therapy.

Conclusion. The method of treatment of endo-periodontal complications with the use of a diode laser made it possible to significantly reduce the focus of destruction of bone tissue in the periapical region; contributed to improving oral hygiene and the condition of periodontal tissues. The high efficiency of the proposed combined method of endo-periodontal lesions treatment allows us to recommend it for wide application in practical dentistry.

Keywords: endo-periodontal pathology, endodontist, periodontium, laser therapy.

Introduction. Inflammatory and destructive periodontal diseases are still one of the urgent and unresolved medical and social problems of modern society, due to the high prevalence, sometimes reaching 90–98%, and due to the continuing trend towards an increase in the frequency of the initial signs of the inflammatory process already among relatively young people [1, 2, 3].

Despite the isolated course of diseases of the pulp, periapical tissues and periodontal tissues, there are often close anatomical and etiopathogenetic connections of the tooth pulp with surrounding tissues through the tubular pathway, that is, through frequent

and numerous lateral root branches or dentine tubules that ensure the penetration of microorganisms and their toxins [4, 5], as well as the vascular pathway through the vascular system from the periodontal to the periapical tissues and back is brought, against the background of the aggravation of the course of the inflammatory process and difficulties in treatment, to the development of combined pathological disorders, called endo-periodontal lesions [6-11]. Pathological changes that occur during the development of both endodontic and periodontal diseases of inflammatory genesis in the pulp and the tissues surrounding the tooth have been the subject of discussion for many years with the participation of scientists from different countries, since it is this kind of pathogenetic relationship between various dental and parotid tissues that today is a common cause of the loss of a large number of teeth, which, in turn, cannot but affect the general condition of the human body as a whole, and the quality of his life, in particular [12-14].

The purpose of the study was to increase the effectiveness of diagnosis and treatment of patients with endo-periodontal lesions.

Materials and methods. The study conducted from 2019 to 2022 on the basis of the Department of Therapeutic Dentistry of the Azerbaijan Medical University included several clinical, instrumental and laboratory stages. At the first stage of clinical research, an analysis of the modern world medical literature devoted to the problems of the level of prevalence, etiopathogenetic risk factors for the occurrence and development and treatment of endo-periodontal lesions was carried out.

At the next stage, a study of 41 patients with EPL, not burdened with somatic pathology, was conducted, including a clinical and instrumental examination and a comparative assessment of therapeutic methods used in patients with combined endodontic and periodontal lesions. Radiation diagnostic methods, in particular orthopantomography and intraoral targeted radiographs, were carried out in both groups and in all patients in these groups before the start of therapeutic measures and 6 and 12 months after their completion. The selected groups of patients were practically comparable in gender and age composition (p>0.05).

The paper provides a comparative assessment of the state of the apical periodontal and periodontium after the proposed treatment protocols in dynamics. All persons with the same diagnosis, depending on the therapeutic method or treatment algorithm, were divided into two groups: I – with the diagnosis of EPL – 20 patients of the main group, who, along with standard treatment, were additionally treated with decontamination of root canal and laser curettage with a dental diode laser (Picasso Life); II – with the diagnosis of EPL was 21 patients of the control group.

Root canal treatment: mechanical expansion with endodontic instruments, antiseptic treatment with 3% sodium hypochlorite solution, 17% EDTA solution. To remove dental deposits in the control group, scaling, curettage with Gracie curettes were performed, and an ultrasound device "Piezon Master 600" ™ EMS was used. Cleaning and polishing of the teeth surface was carried out with an abrasive paste. Patients of the main group were additionally treated with a diode laser. Patients of the control group did not undergo such a procedure.

Criteria for inclusion of individuals in the studied treatment groups:

1. Informed consent of the patient to participate in the study.

2. The age of patients from 25 to 55 years.

3. Clinically and instrumentally confirmed diagnosis of EPL.

4. Absence of pregnancy and somatic pathology.

The exclusion criteria were:

1. Refusal of the patient to participate in the study.

2. Pathological resorption of the tooth root (cement).

3. Severe somatic background.

4. Previously performed endodontic treatment.

5. Pronounced bone resorption of the alveolar process.

6. Periodontal pocket with a depth of more than 5 mm and mobility of teeth of the III degree.

7. Chronic generalized periodontitis.

8. Periapical foci communicating with the maxillary sinus.

Evaluation of the effectiveness of traditional and proposed methods of treatment of endo-periodontal lesions was carried out using clinical (hygienic and periodontal indices, using the simplified hygiene index OHI-S (J. C. Green, J. R. Vermillon, 1964) and papillary-marginal-alveolar index (PMA) modified by Parma (1960)) and instrumental examination of parotid soft and hard tissues, which is based on the study of the X-ray picture with the identification of light areas in bone tissue, as well as on the assessment of the structure, degree of thinning and resorption of bone trabeculae and bone marrow spaces in the periapical region using the periapical alveolar index RAI, proposed by D. Orstavik et al. (1986).

According to the index, the area of the bone destruction focus was calculated using the formula $S=\pi \times \alpha \times \beta$, where S is the area, π is the constant 3.14, α is the radius of the smallest diameter, β is the radius of the largest diameter and is determined by a 5-point system:

1 point – the structure of bone tissue without visible changes;

2 points – poorly expressed radiological changes indicating apical periodontitis, but not typical for it;

3 points – typical for apical periodontitis structural changes, loss of mineral part and loss of bone tissue;

4 points – pronounced enlightenment of the peri-apical focus of destruction;

5 points – radical spread of structural changes in bone tissue.

The outcome of the course of basic therapy was considered satisfactory when the value of PAI, which ranges from 0 to 2 points, and unsatisfactory when the indicators vary from 3 to 5 points.

The study was carried out in compliance with the basic provisions of the "Rules of ethical principles of scientific medical research with human participation", approved by the Declaration of Helsinki (1964-2013), ICH GCP (1996), EEC Directive No. 609 (dated 24.11.1986). All the participants were informed about the goals, organization, methods of examination and signed an informed consent to participate in the completely anonymous study.

Statistical analysis of the results of the study was carried out using the programs Statistica 8.0, Microsoft Excel. Wilcoxon's W-test was used to check the differences between the two paired samples being compared. The magnitude of the change in the trait was calculated for each patient, and with the calculated value of W less than or equal to the critical one, it was concluded that there was a statistical significance of the differences in the compared samples. When comparing independent sets of quantitative data, the Mann-Whitney U-test was used. After calculating the sum of the ranks, with the value of this criterion equal to or below the critical one, the statistical significance of the differences was recognized. In all statistical analysis procedures, the achieved significance level (p) was determined. Differences in indicators were considered statistically significant at a significance level of $p < 0.05$.

Research results. At the initial stage of our study, when studying the medical history and examining 150 patients, endo-periodontal lesions were found in 100 patients who sought dental care. Among them there were 56 men (56.0%) and 44 women (44.0%).

The age distribution was as follows: less than 20 years – 3 people (3.0%); 20–29 years – 12 people (12.0%); 30–39 years – 14 people (14.0%); 40–49 years – 52 people (52.0%); 50–59 years – 19 people (19.0%). It should be noted that at the initial stage of the studies before the start of treatment in the control group of patients with EPL, the difference in the index in comparison with the main group approached a statistically unreliable value (p=0.9153).

At the same time, attention is drawn to the fact that in the main group, the decrease in the indicators of the periapical index characterizing the effectiveness of the treatment was significantly ahead of the values recorded in the control group at the final stage

of instrumental studies, that is, 12 months after the completion of basic therapy (p=0.0190). The revealed average values of the PAI index before the start of therapy and at certain times after its end are shown in **Table 1**.

Table 1 – Dynamics of changes in the PAI index in patients of the main and control groups (points)

Stages of observation	Treatment method		P
	Control group, n=21	Main group, n=20	
Before treatment	2.57 ± 0.148	2.55 ± 0.135	0.9153
After 6 months	2.86 ± 0.125	2.60 ± 0.112	0.1344
P $_{Before}$	0.1477	0.7777	
After 12 months	2.24 ± 0.095	1.90 ± 0.100	0.0190
P $_{Before}$	0.0661	0.0005	
P $_{After\ 1}$	0.0003	0.0001	

Notes: P – statistical significance of the difference between groups (Mann-Whitney U-test); P $_{Before}$, P $_{After\ 1}$ – statistical significance of the difference in the stages of observation (Wilcoxon criterion)

The rationality of using this index in improving the effectiveness of a particular treatment method and in timely relief of pathological processes and prevention of possible complications is determined by the dynamics of changes in its indicators and the slightest deviations in it. In both groups, there was a deterioration in the average values of the PAI index against the background of the development of endo-periodontal complications ($p > 0.05$). Thus, the best data on the effectiveness of the methods used were observed at all stages of research after the completion of complex therapeutic and preventive measures with elements of laser therapy compared with those before treatment and indicators identified at similar times in the control group, that is, in the main group, a stable positive dynamics is recorded during all observation periods.

Against the background of the use of traditional methods of root canal obturation in patients with endo-periodontal syndrome, a weak positive dynamics was revealed, which consisted in the fact that the average values of the periapical index in the control group increased 6 months after treatment compared with PAI before treatment, but not significantly from 2.57 ± 0.148 to 2.86 ± 0.125 points (p=0.1477). This dynamics is clearly shown in the following table and was observed in the main group from 2.55 ± 0.135 to 2.60 ± 0.112 points (p=0.7777).

At the final stage of clinical trials, the average values of the PAI index in both groups began to fall,

but more significantly in the main group, where after the introduction of the laser into endodontic treatment, the indicator of the index sharply and significantly decreased compared to the initial data and reached a value of 1.90 ± 0.100 points (p=0.0005). At the same time, it should be noted that the rates of decrease in the values of the periapical index 12 months after treatment in the main group in relation to the indicators after treatment in the control group were not the same, but statistically significant (p=0.0190). At the same time, a less pronounced decrease in the PAI index during these periods was noted during the examination of patients in the control group – 2.24 ± 0.095 points.

According to the data of clinical studies and index assessment of the periodontal tissue condition at the stages of treatment of endo-periodontal complications, there is a statistically significant decrease in the hygienic index OHI-S in both groups of patients, which indicates the anti-inflammatory effectiveness of the therapeutic and preventive measures carried out here (p<0.001). The statistical analysis showed that at the initial stage of observations, the structure of the compared groups in terms of the hygienic condition of the oral cavity was comparable (p=0.7957). In both experimental groups of dental patients with combined periodontal and endodontic lesions, persons with insufficient hygiene prevailed.

When using a laser, index indicators at the intermediate stage decreased from 2.93 ± 0.072 to 1.70 ± 0.026 points, when using the traditional generally accepted methodology of the course of basic therapy, the dynamics turned out to be less pronounced, as evidenced by the digital data obtained at this stage – the index decrease was from 2.96 ± 0.074 to 1.79 ± 0.040 points. It should be noted that if in the main group the dynamics in the change of hygiene index indicators turned out to be significant and statistically significant during the first 6 months (p<0.001, p=0.0001), then a similar pattern was recorded in the control group, that is, here in the first half of the observation period, the decrease in indicators was significant (p<0.001). In a comparative intergroup assessment of the oral hygiene index OHI-S values obtained for both groups, depending on the method of endodontic treatment, at the intermediate stage from the beginning of the anti-inflammatory measures, the differences were statistically insignificant or insignificant (p>0.05, p=0.7957).

12 months after the completion of complex laser therapy, the hygienic index in patients of the main group had statistically significantly lower values than in the control group, that is, by the end of the observation period, due to a pronounced decrease in OHI-S, the intergroup differences became more pronounced (p=0.0001).

Table 2 – Dynamics of the OHI-S index in patients with EPL depending on the treatment method

Stages of observation	Treatment method		P
	Control group, n=21	Main group, n=20	
Before treatment	2.96 ± 0.074	2.93 ± 0.072	0.7957
After 6 months	1.79 ± 0.040	1.70 ± 0.026	0.0563
P_{Before}	0.0001	0.0001	
After 12 months	1.61 ± 0.033	1.05 ± 0.042	0.0001
P_{Before}	0.0001	0.0001	
$P_{After 1}$	0.0011	0.0001	

Notes: P – statistical significance of the difference between groups (Mann-Whitney U-test); P_{Before}, $P_{After 1}$ – statistical significance of the difference in the stages of observation (Wilcoxon criterion)

When comparing the distribution of the examined patients according to the level of hygiene or environmental situation in the mouth, identified according to the data on the special hygiene index OHI-S, six months after the completion of treatment, the proportion of patients with poor hygiene decreased slightly in both the main and control groups. And in longer observation periods, differences in the distribution of patients by hygiene level were determined as statistically significant due to an increased number of patients with good and satisfactory hygiene from the entire contingent of patients, mainly as a result of the introduction of a diode laser into basic therapy. Analyzing the differences in the hygienic index indicators depending on the treatment method used, at the final stages of observation, we found that the index values in the main group were statistically significantly lower compared to the control group (p<0.001), and in the period from the beginning to the 6th month, the indicator values were reduced, but without noticeable dynamics when comparing intergroup indicators (p=0.0563).

A comparative analysis of the initial values of the periodontal PMA index between the groups did not reveal statistically significant differences (p=0.6009). 6 months after treatment, the detected indicators were comparable (p=0.0144), that is, the recorded data were almost identical and amounted to 25.8 ± 0.42 and 24.2 ± 0.49, PMA values, respectively, in the control and main groups.

12 months after the completion of therapeutic and preventive measures, the values of the studied periodontal index in the main group of patients were significantly lower compared to the control group – 21.9 ± 0.35 and 18.6 ± 0.27, respectively (p=0.0001). Due to the continued positive dynamics in the reduction of index values in the group of patients treated with both

diode laser and traditional treatment, the differences between the indicators detected in both groups after 6 and 12 months of follow-up became more pronounced and statistically significant (p=0.0001 and p=0.0003). The described dynamics of the periodontal PMA index is presented below in the form of tabular data.

Table 3 – Dynamics of PMA index indicators in patients of the main and control groups

Stages of observation	Treatment method		P
	Standard Treatment n=21	+ Diode Laser n=20	
Before treatment	39.5 ± 0.66	39.9 ± 0.61	0.6009
After 6 months	25.8 ± 0.42	24.2 ± 0.49	0.0144
P Before	0.0001	0.0001	
After 12 months	21.9 ± 0.35	18.6 ± 0.27	0.0001
P Before	0.0001	0.0001	
P After 1	0.0001	0.0003	

Notes: P – statistical significance of the difference between groups (Mann-Whitney U-test); P Before, P After 1 – statistical significance of the difference in the stages of observation (Wilcoxon criterion)

According to the results of the study, the values of the hygienic index (OHI-S), the gingivitis index (PMA) and the periapical index PAI before the start of the course of basic therapy for endo-periodontal complications were comparable in both study groups. In terms of follow-up, statistically significant differences were clearly expressed 12 months after treatment.

Discussion. The high frequency of occurrence of combined periodontal and endodontic tissue diseases in male and female individuals, as well as the increase in their prevalence with age, which is confirmed by the results of foreign authors, as well as certain difficulties in the diagnosis and treatment of EPL, causes constant and increased interest in this problem [15]. The results of the index evaluation showed pronounced anti-inflammatory and stimulating bone tissue repair properties of laser therapy, which was previously revealed by clinical studies conducted by Giannelli M. et al., which proved an improvement in the condition of periodontal tissues and stimulation of reparative processes against the background of periodontitis treatment using a diode laser [16].

Conclusion. The method of treatment of endo-periodontal complications with the use of a diode laser significantly reduced the focus of destruction of bone tissue in the periapical region; contributed to the improvement of oral hygiene and the condition of periodontal tissues.

The high efficiency of the proposed combined method of EPL treatment allows us to recommend it for wide application in practical dentistry.

Perspectives of further research. Further studies may be aimed at assessing the feasibility and effectiveness of using a diode laser (Picasso Lite, Italy, wavelength 810 ± 10 nm; average power – 0.1–2.5 W) to improve the results of treatment of severe forms of inflammatory and destructive periodontal diseases and periapical periodontitis as part of basic therapy.

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КОМПЛЕКСНИЙ ПІДХІД ДО ДІАГНОСТИКИ ТА ЛІКУВАННЯ ЕНДОПАРОДОНТАЛЬНИХ УРАЖЕНЬ

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Резюме. *Мета роботи*: підвищити ефективність діагностики та лікування пацієнтів з ендопародонтальними ураженнями.

Матеріал та методи. Дослідження було проведено в 2019-2022 роках на базі кафедри терапевтичної стоматології Азербайджанського медичного університету. Було обстежено 41 пацієнта з ендопародонтальними ураженнями, не обтяжених соматичною патологією з поєднаними ураженнями ендодонту та пародонту. Променеві методи діагностики, зокрема ортопантомографія та внутрішньоротові прицільні рентгенограми, проводились всім пацієнтам до початку терапевтичних заходів, та через 6 та 12 місяців після їх завершення. Виділені групи хворих були практично порівнянними за гендерним та віковим складом (p>0,05).

Усі пацієнти з однаковим діагнозом залежно від терапевтичного методу або алгоритму лікування були поділені на дві групи: I – з діагнозом ендопародонтальні ураження – 20 пацієнтів основної групи, яким поряд зі стандартним лікуванням була проведена терапія додатково з деконтамінацією КК та лазерним кюретажем стоматологічним діодним лазером (Picasso Life); II – з діагнозом ендопародонтальні ураження – 21 пацієнт контрольної групи.

Обробка кореневого каналу: механічне розширення ендодонтичним інструментом, антисептична обробка 3% розчином гіпохлориту натрію, 17% розчином ЕДТА. Для видалення зубних відкладень у контрольній групі здійснювали скейлінг, кюретаж кюретами Грейс, та використовували ультразвуковий апарат «Piezon Master 600» EMS. Чищення та полірування поверхні зубів здійснювали абразивною пастою. Пацієнтам основної групи застосовували додатково діодний лазер. Пацієнтам контрольної групи такої процедури не проводили.

Результати. Згідно з результатами проведеного дослідження значення гігієнічного індексу (OHI-S), індексу гінгівіту (PMA) та періапікального індексу PAI до початку курсу базової терапії ендопародонтальних ускладнень були зіставні в обох досліджуваних групах. За термінами спостереження статистично значущі відмінності чітко виражені через 12 місяців після лікування.

Висновки. Метод лікування ендопародонтальних ускладнень із застосуванням діодного лазера дозволив достовірно зменшити вогнище деструкції кісткової тканини в періапікальній ділянці; сприяв поліпшенню гігієни порожнини рота та стану тканин пародонту.

Ключові слова: ендопародонтальна патологія, ендодонт, пародонт, лазерна терапія.

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